Unit 1 Important Topics:
Aim # 1: Lab Safety
Aim # 2: Tools/Measurement
Aim # 3: Observations vs. Inferences
Aim # 4: Scientific Method
Aim # 5: Graphing
Aim # 6: Microscope and Microscopic Measurement

I. Aim # 1 - Lab Safety (Use your Aim # 1 Notes)

1. List three actions you should do in the lab.
   a. _____________________________________________________________
   b. _____________________________________________________________
   c. _____________________________________________________________

2. List three actions you shouldn’t do in the lab.
   a. _____________________________________________________________
   b. _____________________________________________________________
   c. _____________________________________________________________

3. Describe the proper way to heat a test tube. Include safety equipment the student should use as well as how the student should hold the test tube. Be sure to mention what you should never put in a test tube while heating
   _____________________________________________________________
   _____________________________________________________________
   _____________________________________________________________
   _____________________________________________________________
   _____________________________________________________________
   _____________________________________________________________
II. Aim # 2- Tools and Measurement (Use your Aim # 2 Notes)

4. Directions: Match the Tool to its correct picture and name.

<table>
<thead>
<tr>
<th>Place your answer here (CAPITAL LETTERS)</th>
<th>Name</th>
<th>Picture</th>
<th>Proper Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Safety Goggles</td>
<td><img src="image" alt="Safety Goggles" /></td>
<td>H. Used to hold, heat, and measure liquids (larger amounts)</td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Test tube</td>
<td><img src="image" alt="Test tube" /></td>
<td>I. Protects eyes from chemicals, fire, glass and other substances</td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Test tube and Beaker</td>
<td><img src="image" alt="Test tube and Beaker" /></td>
<td>J. Used to hold and measure liquids (smaller amounts because it is more precise than a beaker)</td>
</tr>
<tr>
<td></td>
<td>Tongs</td>
<td><img src="image" alt="Tongs" /></td>
<td></td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Beakers</td>
<td><img src="image" alt="Beakers" /></td>
<td>K. Used to measure and transfer small amounts of liquid</td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Graduated Cylinder</td>
<td><img src="image" alt="Graduated Cylinder" /></td>
<td>L. Used to heat objects</td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Pipettes</td>
<td><img src="image" alt="Pipettes" /></td>
<td>M. Used to hold and or heat liquids</td>
</tr>
<tr>
<td>Picture: _______ Usage: _______</td>
<td>Hot plates</td>
<td><img src="image" alt="Hot plates" /></td>
<td>N. Used to hold hot test tubes or beakers</td>
</tr>
</tbody>
</table>

5. Circle the unit that is used to measure each physical quantity.

   a. Mass is measured in **liters/meters/grams/seconds/or Celsius**
   b. Length is measured in **liters/meters/grams/seconds/or Celsius**
   c. Volume is measured in **liters/meters/grams/seconds/or Celsius**
   d. Temperature is measured in **liters/meters/grams/seconds/or Celsius**
6. Which instrument is used to measure mass? __________________________________________

7. Which instrument is used to measure length? ________________________________________

8. Which instrument is used to measure volume? _______________________________________

9. Which instrument is used to measure temperature? ________________________________

10. Directions: Measure the following objects. Be sure to be accurate.

a. The block is _____________ cm.

b. The block is _____________ mm

c. A student, using a metric ruler, measured a larva as represented in the diagram below.

What is the length of the larva, in millimeters? (1 pt)

___ mm

d. =___ mL   =___ mL   =___ mL   =___ mL

e. The thermometer reads _____ °C

III. Aim # 3: Observations vs. Inferences (Use your Aim # 3 Notes)

11. What is Biology?

____________________________________________________________________________________

12. What is a theory?

An ___________________ of natural phenomena __________________ by many
___________________________.

13. How are inferences different than observations?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
IV. Aim # 4- Scientific Method (Use your “Aim # 4 Notes).

14. Define the following vocabulary words:
   a. **Hypothesis:** ____________________________________________________________
      ____________________________________________________________
      **It should never be a QUESTION!**

   b. **Control Group:** the group that __________________________________________
      the experimental ______________________ or is kept under “________________________” conditions

   c. **Experimental Group:** The group(s) that ________________________________
      the experimental ______________________________.

   d. **Independent Variable:** the item that is being ____________________________ in the experiment.
      • What “I” __________________________.

   e. **Dependent Variable:** what is being ________________________________/the results
      • __________________________ collected
      • Always include your units

   f. **Constants:** factors that remain the __________________________ between the __________________________

   g. **List the general steps of the scientific method:** ask a ____________________________ →
      form a _______________________________ → create an ____________________________
      → perform the _______________________________ → record and organize the __________
      → analyze the __________________________ and draw ______________________________ →
      __________________________ or modify the experiment → report your __________________________
      (peer review).

15. What are the characteristics of a good experiment?
   a. __________________________ the experiment!
   b. **Increase/Decrease** the sample size/test subjects. (Circle one)
   c. Perform the experiment over a shorter/longer period of time. (Circle one)
16. **Read the following experiment and identify the following parts of the experiment.**
Maverick wants to find out whether or not Miracle Grow really makes plants grow faster. He takes two identical pots, puts ½ cup of dirt into each one, and puts 3 pea plant seeds into each one. He waters the plants the same amount at the same time each day. The only difference is that one plant is watered with regular water, while the other is watered with water that has Miracle Grow in it.

   a. Identify the **experimental group**.
      The plant that…

   b. Identify the **control group**.
      The plant that…

   c. Identify the **independent variable**. ____________________________

   d. Identify the **dependent variable**. ____________________________

   e. How could the experiment be **improved**? List two ways

17. **Read the following experiment and identify the following parts of the experiment.**
Bailey wants to find out which frozen solid melts the fastest: soda, ice, or orange juice. She pours each of the three liquids into the empty cubes of an ice tray, and then places the ice tray in the freezer over night. The next day, she pulls the ice tray out and sets each cube on its own plate. She then waits and watches for them to melt. When the last part of the frozen liquid melts, she records the time.

   a. Identify the **independent variable**. ____________________________

   b. Identify the **dependent variable**. ____________________________

   c. Identify two **constants or controls**. 1) ____________________________

      2) ____________________________
V. Aim # 5- Graphing (Use your Aim # 5 Notes).

18. Complete the graph below by completing the following tasks.
   a. Create a title (1 pt)
   b. Label the x and y axis. Be sure to include units (1 pt)
   c. Create an appropriate scale, without any breaks in the data, on each labeled axis. (1 pt)
   d. Plot the data on the grid. Surround each point with a small circle and connect the points. (1 pt)

   The amount of oxygen gas dissolved in water is important to the organisms that live in a river. The amount of dissolved oxygen varies with changes in both physical factors and biological processes. The temperature of the water is one physical factor affecting dissolved oxygen levels as shown in the data table below. The amount of dissolved oxygen is expressed in parts per million (ppm).

   **Dissolved Oxygen Levels at Various Temperatures**

<table>
<thead>
<tr>
<th>Water Temperature (°C)</th>
<th>Level of Dissolved Oxygen (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
</tr>
</tbody>
</table>

19. Identify the independent variable: ___________________________________________________________

20. Identify the dependent variable: ___________________________________________________________

21. Predict the level of dissolved oxygen at 22 °C. Be sure to include units. _______________________

22. Describe the relationship between water temperature and level of dissolved oxygen. 

   _________________________________________________________________________________________

   _________________________________________________________________________________________
VI. Aim # 6 Microscopes (Use your Aim # 6 Notes)

23. Name three ways in which an image looks different under a microscope compared to real life.
   1. _______________________
   2. _______________________
   3. _______________________

24. Label the microscope below.
Label # 1, 10, 3, 4, 12, 7, and 8 on the microscope below.

   Directions: Write the name of the correct microscope part.

25. If a student is viewing a specimen and it is very dark, which part of the microscope would he/she adjust to let more light through? ________________________________________________________________

26. Which knob would you turn to move objective lenses closer to the specimen to focus the image?
   ______________________________________________________________________

27. If the image is blurry, which knob would you turn to sharpen the image?
   ______________________________________________________________________

28. Besides being larger, how does an image change when it is viewed under the microscope?
   ______________________________________________________________________

29. Fill out the diagram below to describe how an image looks like under both low power and high power.

<table>
<thead>
<tr>
<th>Under Low Magnification (Low Power)</th>
<th>Under High Magnification (high Power)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• _______________ image</td>
<td>• _______________ image</td>
</tr>
<tr>
<td>• See __________ of the organism</td>
<td>• “Zoomed in” ___________ of the organism</td>
</tr>
<tr>
<td>• See __________ organisms</td>
<td>• See __________ organisms</td>
</tr>
<tr>
<td>• ______________ field of view</td>
<td>• ______________ field of view</td>
</tr>
<tr>
<td>• ______________ image</td>
<td>• ______________ image</td>
</tr>
<tr>
<td>adjust ___________________ to let more light in</td>
<td></td>
</tr>
</tbody>
</table>
30. Calculate the Total Magnification for the following examples. (Remember eyepiece x objective lens = total mag)
   a. Eyepiece = 10x, Low Power Objective Lens = 4x
      Total Magnification = ______________________________
   b. Eyepiece = 10x, High Power Objective Lens = 40x
      Total Magnification = ______________________________
   c. Eyepiece = 15x, High Power Objective Lens = 50x
      Total Magnification = ______________________________

31. When making a wet mount slide students are instructed to add the coverslip slowly at a 45 degree angle. Explain why.
   ______________________________________________________________________________________
   ______________________________________________________________________________________

32. Explain why a student would add stain, like iodine, to cells. ______________________________________
   ______________________________________________________________________________________

33. Look at the picture below. Explain why the student added the paper towel to one side of the slide.
   ______________________________________________________________________________________
   ______________________________________________________________________________________

34. Which unit of measurement is used to measure cells and their organelles? _______________________

35. How many micrometers are in 1 millimeter? _______________________

36. Calculate the low power field of view below by converting millimeter to micrometers
   a. The field of view under low power is 3.5 millimeters. What is the low power field of view in micrometers?
      ______________________________________________________________________________________
   b. The field of view under low power is 1.2 millimeters. What is the low power field of view in micrometers?
      ______________________________________________________________________________________
   c. The field of view under low power is 4.5 millimeters. What is the low power field of view in micrometers?
      ______________________________________________________________________________________

37. If 5 cells fit across the field of view and the low power field of view is 2.5 mm across, estimate how many micrometers long each cell is. (Make sure you convert from millimeters to micrometers first and then figure out how many micrometers long each cell is). Round to the nearest tenth and SHOW YOUR WORK.
   Answer: _______________________

   Answer: _______________________
   _______________________
   _______________________
   _______________________
   _______________________
   _______________________
   _______________________
   _______________________

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